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Removal Of Dyes From Textile Waste Water Using Adsorption By Activated Carbon Of Rice Husk

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***Abstract:** The results of are going to be presented right now. This body of work in research is predicated on a case study of a waste water treatment facility belonging to the Koh-e-Noor Textile Industry, which can be found in Pakistan. The researchers utilized Congo red and magenta dyes in their work. In order to evaluate the percentage of dyes that were removed after aging, we chose to focus on the effects of two parameters: agitation time and adsorbent dose. The two colours that were chosen are hygienic, however they both irritate the skin and can lead to allergic dermatitis. It was discovered that increasing both the agitation period and the amount of adsorbent used led to an increase in the percentage of age removed from both colours. When the agitation time was changed, the amount of age removed from the Congo red dye was 88 percent, while the amount of age removed from the magenta dye was 85 percent. However, when the amount of adsorbent dose was changed, the amount of age removed from the Congo red dye was 69.3 percent, while it was 95.3 percent. It has been discovered that activated carbon made from rice husk may remove both of these colours. According to these findings, the removal of colors using activated carbon made from rice husk is an effective and cost-effective way to accomplish the task.*

Key Words: Textile waste water, dyes, adsorption dose, Congo red & magenta dyes, changed, removed, Congo red.

Waste water from the textile industry typically includes caustic soda, starch, detergents, wax, pigments, and colors. The presence of these pollutants raises textile waste water's biochemical oxygen demand (BOD), chemical oxygen demand (COD), solid content, and toxic level. Textile mills typically release their untreated wastewater into local municipal or industrial sewer systems, in addition to surrounding drains and ponds that have stagnant water. In recent years, the Environmental Protection Agency (EPA) in Pakistan has been given legal standing. Textile waste water must be discharged only after receiving the appropriate treatment and doing so in accordance with the National Environmental Quality Standards (NEQS). The textile industry in Pakistan are looking for ways to handle their waste water that are both cost-effective and environmentally friendly.

TREATMENT METHODS FOR REMOVAL OF DYES- The primary methods and technologies for removing color can be broken down into the following three categories (which are also provided): Each one of them has positives and negatives to offer. The following is an explanation of each of these color removal methods:;
1. Biological treatment, 2. Chemical treatment, 3. Physical treatment

Treatment of textile waste water has been the subject of a significant amount of study and investigation. More than a hundred references have been provided by Marrot and Roche[1] regarding the treatment of textile waste water. The processes of adsorption were researched by Pala and Tokat[2] (on activated carbon, Biological sludges). Malik and Sanyal[3] described various techniques for the removal of dyes, such as chemical coagulation, air flotation, and adsorption. According to the findings of Basibuyuk and Forster's[4] research, AZo dyes do not undergo biodegradation when exposed to aerobic environments. Halliday and Beszedits[5] successfully cleaned waste water from a textile industry by combining activated sludge with powder activated carbon (PAC). Brower and Reed [6] shown that the color of industrial origin cannot be eliminated by the biological treatment procedures used in municipal wastewater treatment facilities. The treatment of willow dust residue, a solid cellulose textile waste, by Balarubramanya[7] involved anaerobic batch fermentation in the absence of oxygen. Due to the synergistic sorbing activity of magnesium carbonate hydrated basis and calcium carbonate, Panswad and Wong Chaisuwan [8]

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demonstrated that magnesium carbonate hydrated basis was superior to alum and quick lime for the removal of reactive color. The adsorption of canto red on a variety of activated carbons was investigated by Kannan and Sundaram[9]. P.K. Malik[10] utilized activated carbons made from sawdust and rice husk for the adsorption of acid dye, acid yellow 36, and came to the conclusion that the adsorption capacity of these activated carbons was reasonably good. As a basis for his analysis, he considered the adsorbent dosage, pH, and contact time. The researchers Namasivayam and Kavitha[11] investigated the process of removing Congo red from water by adsorption onto activated carbon made from coir pith, which is a waste product from agricultural production. Over the past ten years, Gregorio Crini has focused a great deal of his research and development efforts on the use of adsorption to remove colours from waste water. He investigated the adsorption of dyes on betacyclodextrin polymer [12], non-conventional Low cost adsorbents for dye removal [13], the application of chitosan, a natural amino polysaccharide, for dye removal from aqueous solutions by adsorption processes using batch studies [14], the use of corn flour for dye removal from pulp and paper effluents [15], and a number of other topics [16-18 The preparation, characterisation, and sorption capabilities of cross-linked starch-based exchangers [16], as well as the adsorption of various different types of dyes on cross-linked polysaccharide derivatives, have been investigated.[17], modified starch filters that are made from starch and are used to remove dyes from waste water[18].

EXPERIMENTAL- To begin, I made the stock solutions of dyes at a concentration of one thousand milligrams per liter (Congo-red and magenta). After that, using a visible spectrophotometer, you measured the absorbance of the standard solution that you made from the stock solution, which ranged from 10 to 100 mg/liter. Drawing the calibration curves (between concentrations versus absorbance) at the wavelength for maximum absorbance (max = 497, 510 nm for Congo red and magenta) using the data that was acquired is the first step in the calibration process. After making a concentrated solution of Congo red dye to the level of 30 ppm, 0.1 grams of activated carbon were added to the solution. After placing the solution in the magnetic shaker, we watched how the absorbance of the solution changed throughout the course of the experiment. This allowed us to determine how the concentration of the solution evolved (interval 5 minute). Create a graph showing the agitation times in relation to the percentage of dye that was removed. Notated the qt, which represents the quantity of dye that was absorbed at any given time t. Additionally, we found the date of absorption by drawing the graph that compares logs (qeqt) to the passage of time. A concentrated solution of magenta dye with a concentration of 65 ppm was taken from the stock solution. The amount of activated carbon that was added to the solution ranged from 0.1 gram to 1.0 gram. Place the solution inside the magnetic shaker, and shake it for a full five minutes. Utilizing absorbance, one may determine the concentration of the substance. The amount of dye that was absorbed at any given moment was recorded down, and you drew a graph depicting the relationship between the percentage of dye that was removed and the amount of adsorbent that was used. Additionally, we established the date of absorption by plotting log (qe-qt) against time on a graph and drawing it.

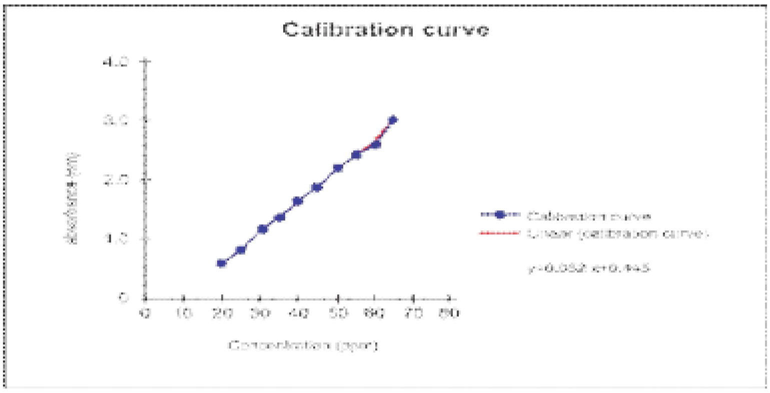

Figure 1 calibration curve

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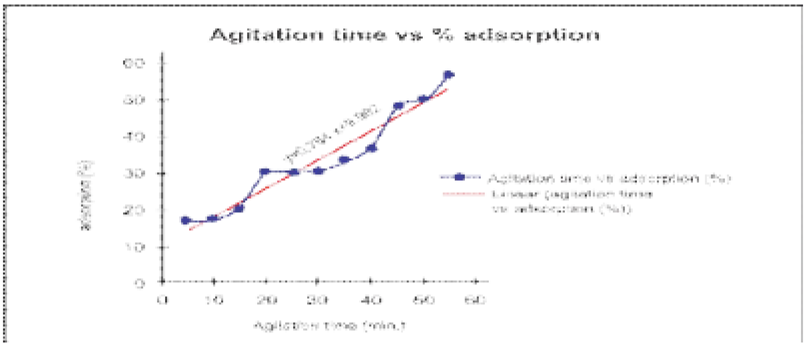

Figure 2 effect of agitation time on %age adsorption for congo red

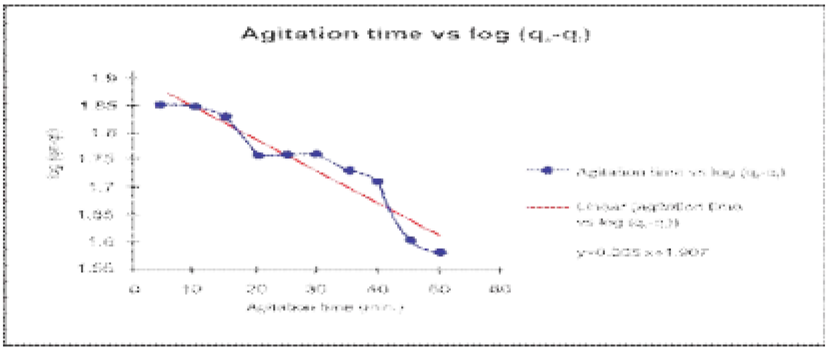

Figure 3 residual concentration of dyes as a function of time

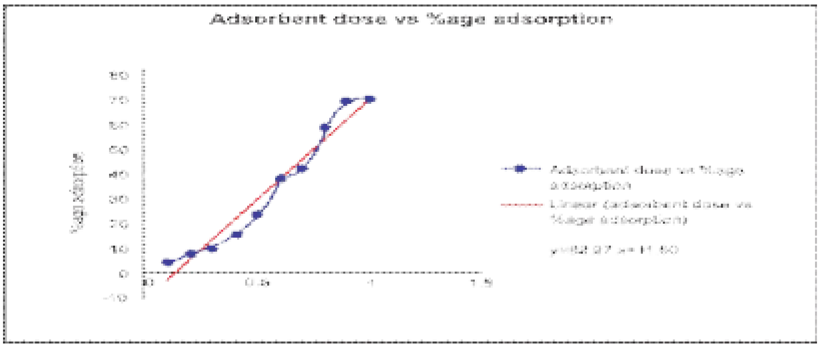

Figure 4 effect of adsorbent dose on %age adsorption for congo red

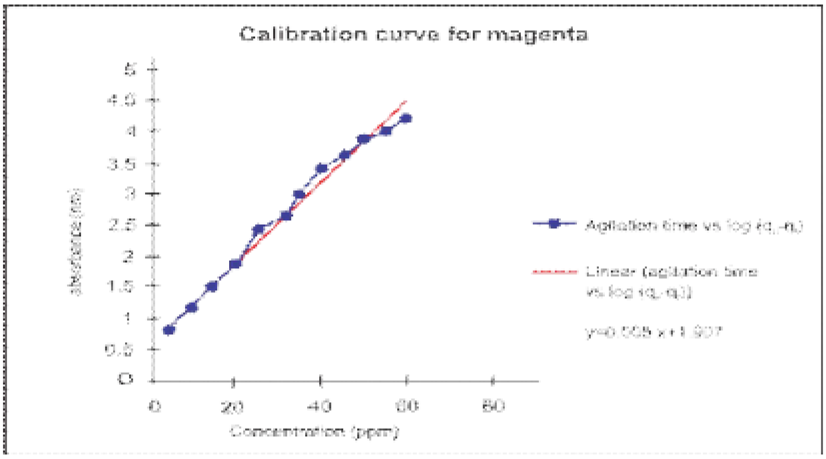

Figure 5 Calibration curve for magenta

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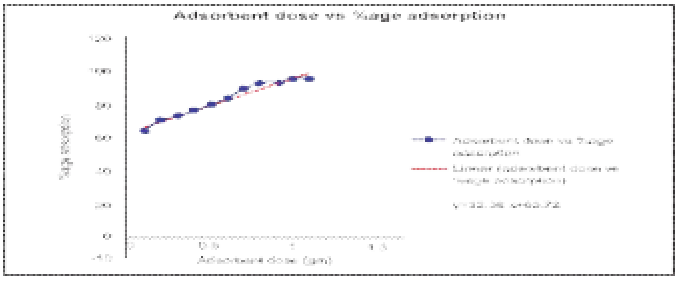

Figure 6 effect of agitation time on %age adsorption for magenta

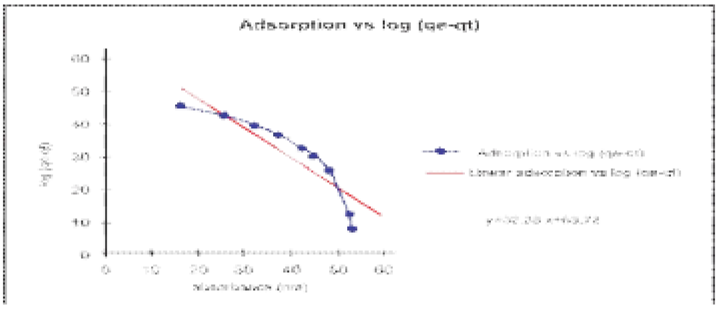

Figure 7 Kinetic model of absorption

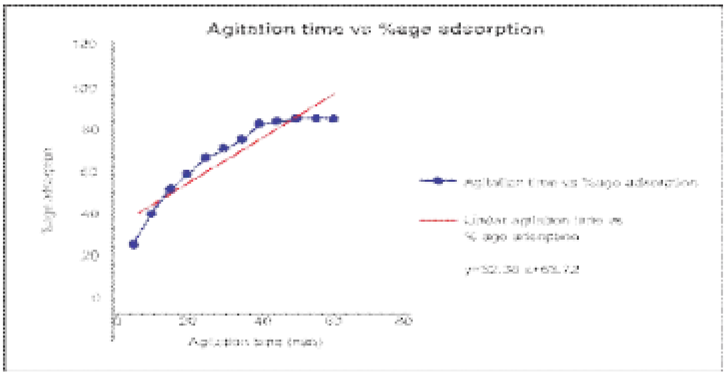

Figure 8 effect of adsorbent dose on %age adsorption for magenta

RESULTS AND DISCUSSION- The adsorption of dyes was investigated by using the two parameters.

1. Agitation time
2. Adsorbent dose

Calibration- The findings presented in figure 1 of the calibration curve show that an increase in the concentration of Congo red dye results in a corresponding rise in absorbance. The relationship between the concentration of Congo red and absorbance looks like a straight line, which indicates that the absorbance is at its highest level when measured against Congo red solution. The calibration curve demonstrates that Beer's law is respected over the concentration spectrum (0.5 65 mg). The calibration curve for the magenta dye can be seen to be a straight line in Figure 5. The calibration curve demonstrates that there is a positive correlation between the concentration of the solution and the absorbance.

Effect Of Agitation Time- Flasks were used to collect samples of Congo red and magenta with initial concentrations of 30 mg/l. These samples were then subjected to adsorption using 0.1 gm of adsorbent dosage. Figure 2 illustrates the effect that the amount of contact time and the initial dye concentration have on the adsorption of Congo red. It is demonstrated that the graph between agitation time and percent age adsorption is a straight line, which demonstrates that as the agitation time increased, so did the percentage of age adsorption. The data demonstrates that the increase in percent age adsorption occurs gradually at first, but as time passes, the increase in percent age adsorption also increases. Additionally, the variation in percent age adsorption of dye that occurs due to the passage of time is indicated. It is clear from the graph that the activated carbon of rice husk treatment resulted in the removal of fifty percent of Congo red in fifty-five minutes, which increased to eighty-eight percent in seventy minutes. Meanwhile, figure 6 demonstrates that the removal of magenta is seventy-five percent in thirty-five minutes, and it increased to eighty-five percent in sixty-five minutes. It is because of the creation of monolayer coverage on the outer surface of the adsorbent, which is responsible for this [9]. It is possible that a reduction in the thickness of the diffusion layer that surrounds the adsorbent particles is responsible for the rise in the rate at which color is removed as the agitation time increases.

Adsorption Dynamic- The dynamics of adsorption were investigated utilizing a variety of approaches to the rate-controlling step. According to Figure-3, the rate of adsorption of Congo red solution is 0.00187307, and the time it takes for equilibrium to be reached is determined by a series of experiments. The concentration of dyes that has been left behind is depicted as a curve that varies with time. According to the findings, the adsorption process reaches perfect equilibrium after one hour. As can be shown in Figure 7, the rate of adsorption of magenta is 0.02329 minutes-1. The minimum value for the Congo red kad is 0.008173007 For magenta red kad = min?1is 0.02329

Effect Of Adsorbent Dose- When it comes to the process of extracting dyes from aqueous solutions, the effect of adsorbent dosage is another factor that is explored. Using Congo red and magenta with an initial concentration of 65 mg/l, treat the solution with varying adsorbent doses ranging from 0.1 gm to 1.1 gm while maintaining the other parameters at the same levels. Figures 4 and 8 illustrate that an increase in the amount of adsorbent used results in a higher percentage of age being absorbed. According to the data and the graph, the rate of rise in the percentage of age adsorption is linear. It has been demonstrated that the removal of the 65 ppm solution of Congo red dye requires one gram of activated carbon made from rice husk. It has been noted that the adsorption of dyes settles into a steady state after a certain amount of time; the percentage of age adsorption for Congo red is 69.3 percent at 0.9 g dosage, but the percentage of age adsorption for magenta is 95.3 percent at 1 g dosage. Because it is a known truth that greater adsorbent dose is more beneficial to absorb the dyes from its solution, graphs demonstrate that the percent age adsorption of dyes increases related to the adsorbent dose. However, there is a point that is reached where the maximum adsorption is done at a certain dose. This dose is seen as a metric that remains constant.

CONCLUSIONS- I tried getting rid of colours using an adsorption method that involved employing activated carbon made from agricultural waste (specifically, rice husk), and I discovered that this was the most cost-effective approach. There is definitely room for efficiency gains, and additional study in this area is strongly encouraged. Only two of the dyes were chosen by myself during the performance (Congo red, magenta). In order to evaluate the efficacy of the technique even further, it may be helpful to conduct research on different dyes that use the similar method. The parameters that I worked on were the agitation time and the adsorbent dose, and I discovered that the percentage of age adsorption is exactly related to both of those parameters. In order to make an even more accurate evaluation, there are a variety of different parameters whose effects need to be researched, and the results should be reviewed.

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